

## The genus *Julavis* de Laubenfels (Porifera: Halichondrida)

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*Abstract.*—*Julavis jamaicensis* new species is reported from Northern Jamaica. This represents the second record of the genus and the first from the Atlantic basin. *Julavis* de Laubenfels 1936 was erected to accommodate *Tedania levis* Kirkpatrick 1900 from the Funafuti Atoll, Central Pacific. Its status was never discussed prior to the present paper and order and family allocation (Poecilosclerida: Acarniidae) have remained tentative. It is proposed to allocate it to the order Halichondrida, family Desmoxyidae, on the basis of confused skeletal architecture, possession of acanthose diactines and wispy trichodragmas. The genus is distinguished from other genera of Desmoxyidae by its smooth strongylostyles and by the strongylote nature of the acanthose diactines. The contents of the family Desmoxyidae is discussed and compared with related families.

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Kirkpatrick (1900) described from deep waters (90–125 m) off the atoll of Funafuti, Central Pacific, a thinly encrusting sponge with the unusual skeletal structure of a feltwork of spined strongyles with scattered smooth strongyles, combined with frayed trichodragmas. He named the species *Tedania levis* but admitted that it was "... only placed in *Tedania* provisionally, ... should probably come under a new genus near *Tedania* ...". De Laubenfels (1936) in his monograph of the orders, families and genera of the Porifera erected a new genus *Julavis* (origin of the name not explained) without having seen the original material. His definition for the new genus was: "... two distinct categories of spiny strongyles (sic) for megascleres and raphides for microscleres." This is a misrepresentation of Kirkpatrick's description, as there are smooth and spiny megascleres rather than two spiny types. Since then, as with so many other "paper" genera of de Laubenfels, no further reference was made in the literature on either *Tedania levis* or the genus *Julavis*.

Recently, one of us (HL) collected an orange encrusting sponge off the north coast of Jamaica, with characters closely similar to those of *Tedania levis*. This material is described below as a species new to science and compared to the type specimen of *T. levis* borrowed from the collections of the Natural History Museum, London (BMNH).

In view of the fact that there are now two species answering to the definition of *Julavis*, it is proposed to consider the genus as valid. Its family and order allocation has to be changed from Poecilosclerida: Acarniidae, as proposed by de Laubenfels, to Halichondrida: Desmoxyidae; this will be discussed below.

### *Julavis jamaicensis*, new species

Figs. 1–3

*Material examined.*—Holotype: Zoological Museum Amsterdam, Porifera collection, reg.no. ZMA POR.11520. Jamaica, off Chalet Caribe, Montego Bay in 20 m depth, dried specimen.

*Description.*—Thinly encrusting on the

surface of a large dead sclerosponge, *Ceratoporella nicholsoni* (Porifera: Ceratoporellidae). The type specimen was sawed out of the basal skeleton of a large (25 cm diameter) specimen of the sclerosponge (Fig. 1). It is about 1 mm thick, lateral expansion at least  $10 \times 15$  cm. Surface in dry condition smooth, hard, crumbly, difficult to section tangentially. No visible oscules or openings. Colour light orange to beige.

Skeleton (Figs. 2A–B) in dry condition a packed feltwork of confusedly arranged acanthostrongyles with occasional single smooth long spicules in a position perpendicular to the surface. The outermost acanthostrongyles tend to form an irregular palisade with apices pointing outward at different angles. Rarely, the smooth long spicules form bundles. Trichodragmas are scattered throughout the spicule mass. The organic parts are greatly reduced (no doubt due to shrinking). There is no recognizable spongin, but the narrow space between the spicules is definitely fibrous.

Spicules (Figs. 2C–E, 3, Table 1) include acanthostrongyles, strongylostyles and trichodragmas. Acanthostrongyles (Figs. 2C, 3.1–3) are in majority entirely covered by coarse blunt spines; they are somewhat irregularly shaped, often curved, with apices slightly narrower than the shaft. Occasionally they are almost entirely smooth (Fig. 3.2) or smooth asymmetrically at one of the ends (Fig. 3.3); juvenile spicules are finely acanthose, almost smooth, oxea-like (Fig. 2C, middle spicule). Size  $127\text{--}258 \times 8\text{--}20$   $\mu\text{m}$ . Strongylostyles (Figs. 2D, 3.4) are smooth, style-like but conically rounded at one end and often rather bluntly pointed or stair-stepped at the other. Occasionally the conical end is rhabdose, i.e. abruptly curved. They are rare both in sections and in dissociated spicule mounts and invariably broken. Size up to at least  $850 \times 4\text{--}8$   $\mu\text{m}$ . Trichodragmas (Figs. 2E, 3.5–6) form wispy, straight or S-curved bundles of 12–20 raphides. Bundles may be entirely sheathed and then superficially resemble

oxea-like spicules (Fig. 3.5). Size  $52\text{--}152 \times 2\text{--}8$   $\mu\text{m}$ .

Ecology: the sclerosponge encrusted by the new species was collected in a cave.

*Comparison with Tedania levis.*—The type specimen of *T. levis*, BMNH 1900.10.19.16, is a thin crust of 1.5 mm on a small piece of coralline alga. It has the same appearance and consistency as *Julavis jamaicensis*. Differences between the two species are mostly confined to details of the spicules (Table 1). The acanthostrongyles form the same felted mass as in *J. jamaicensis*, but the uppermost are tangentially arranged (Fig. 4A–B), rather than in a palisade. The acanthostrongyles (Figs. 4C, 5.1–2) are much more strongly curved and distinctly longer and thinner than those of *J. jamaicensis*:  $211\text{--}340 \times 7\text{--}14$ . The long smooth spicules (Figs. 4E, 5.3) closer to typical strongyles, although they also show somewhat unequal ends. Their sizes appear to be somewhat longer: up to  $1385 \times 4\text{--}12$   $\mu\text{m}$ . A shorter category of styles reported by Kirkpatrick (245  $\mu\text{m}$ ) appears to be foreign. The trichodragmas (Figs. 4D, 5.4–6) are similar but longer than those of *J. jamaicensis*:  $144\text{--}203 \times 3\text{--}12$   $\mu\text{m}$ .

These skeletal differences in themselves do not form an impressive load of evidence for specific distinctness between the two specimens because specific variation is unknown. However, the wide geographic separation of the recorded specimens supports these small morphological differences and we erect the new species with confidence.

*Generic allocation.*—De Laubenfels (1936) erected *Julavis* on the basis of the incompatibility of the described characters of *Tedania levis* with those of the genus *Tedania*. It is clear from recent discussions on the contents of *Tedania* and the family Tedaniidae (e.g., in Desqueyoux-Faúndez & van Soest 1996) that de Laubenfels was correct in removing *T. levis* from *Tedania*. The synapomorphy for Tedaniidae, i.e., onychaetes, is lacking in *T. levis*. With two related species known, use of the genus *Julavis* is certainly justified. It remains a rare





Fig. 1. *Julavis jamaicensis* new species, photo of holotype encrusting *Ceratotoporella nicholsoni*.

genus with only two records at opposite sides of the world, perhaps indicating a wider Tethyan distribution.

*Family and order allocation.*—The major problem with *Julavis* is the family and order allocation. De Laubenfels (1936) assigned *Julavis* to the family Acarniidae, erected for an odd assortment of genera, including among others *Sceptrintus* (now Hadromerida: Latrunculiidae), *Janulum* (Poecilosclerida: Raspailiidae), *Jelissima* (Poecilosclerida: Myxillidae) and *Jones* (Poecilosclerida: Coelosphaeridae). The type genus of the family Acarniidae is *Acarnia* Gray, 1867, erected for type species *Hymeniacidon cliftoni* Bowerbank, 1864, which is a junior synonym of *Clathria frondifera* (Lamarck 1814) (see Hooper & Wiedenmayer 1994: 256). Thus, Acar-

niidae de Laubenfels, 1936 is a junior synonym of Microcionidae Carter, 1875. *Julavis* needs to be removed from Acarniidae/Microcionidae because it lacks the ectosomal subtylostyles, toxas and palmate isochelae characteristic for this family.

The skeletal architecture and spicule complement would allow allocation to both Poecilosclerida (e.g., family Crellidae) and Halichondrida (e.g., families Desmoxyidae and Halichondriidae).

Crellidae have a surface crust of acanthoxeas or acanthostyles and a choanosomal skeleton consisting of bundles of smooth tornotes, which may be oxea-like, strongly-like or style-like. Normally there are chelate microscleres and short echinating acanthostyles, but these may be absent. Allocation of *Julavis* to Crellidae is not warranted for

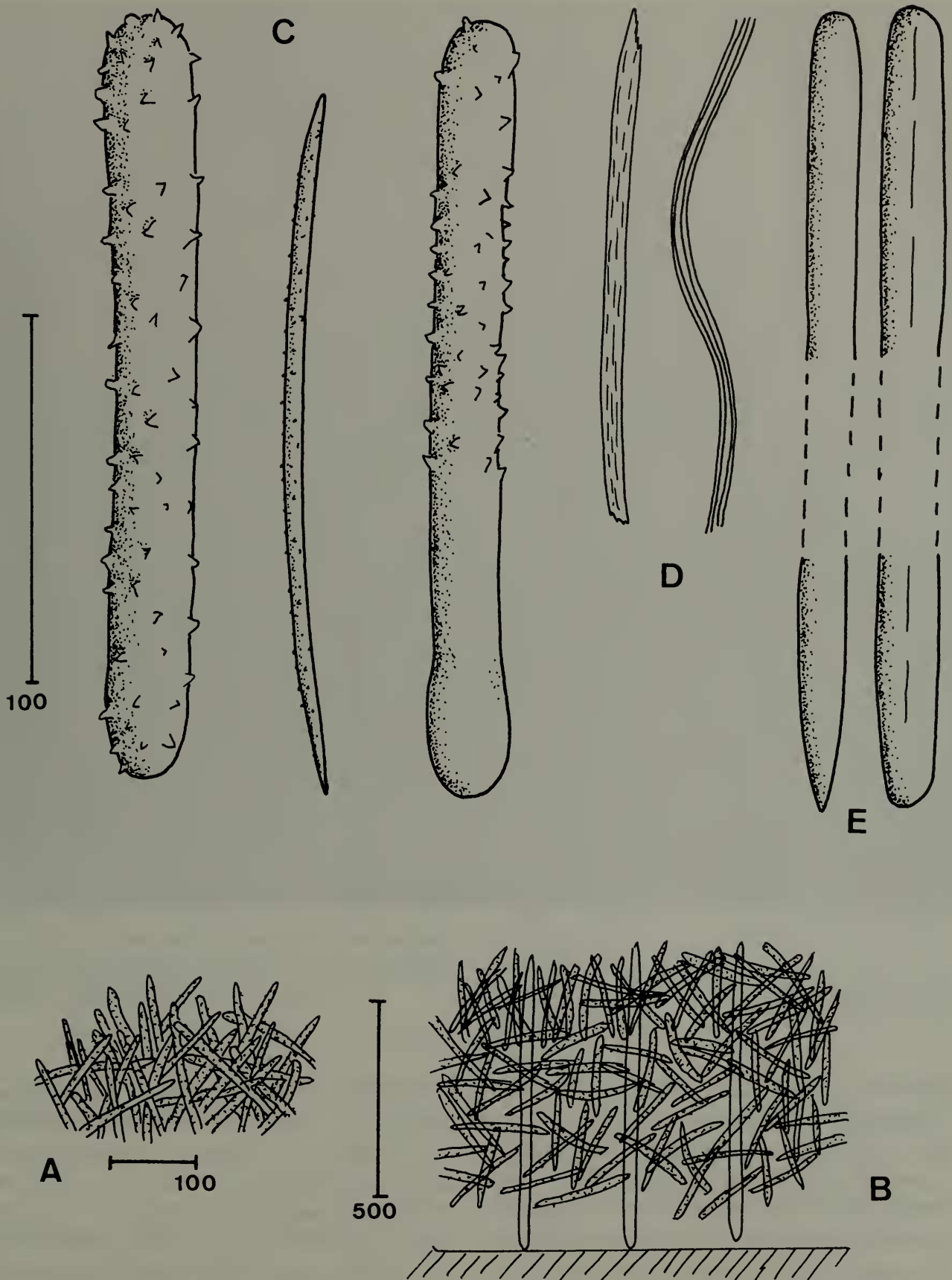


Fig. 2. *Julavis jamaicensis* n. sp., drawings of skeleton and spicules. A, surface view of ectosomal skeleton; B, cross section; C, various growth stages of acanthostrongyles; D, trichodragmas; E, smooth style and strongylole modification.



Fig. 3. *Julavis jamaicensis* n. sp., Scanning electronic microscope (SEM) photos of the spicules. 3.1, a fully spined acanthostrongyle ( $\times 650$ ); 3.2, virtually smooth "acanthostrongyle" ( $\times 650$ ); 3.3, partly smooth, partly spined acanthostrongyle ( $\times 650$ ); 3.4, style ( $\times 650$ ); 3.5, sheathed trichodragma ( $\times 2200$ ); 3.6, irregularly fanned-out trichodragma ( $\times 2200$ ).

the following reasons: Crellidae tend to be soft sponges with surface areolae or veinal canals visible; the tangential surface crust is generally thin (single spicule layer) and strictly tangential; the acanthose spicules are never strongyles; the tornotes are seldom longer than  $300\ \mu\text{m}$  and never over  $600\ \mu\text{m}$ ; and, no trichodragmas have been recorded from Crellidae.

Halichondriidae and Desmoxyidae are considered closely related families in a re-defined order Halichondrida by van Soest et al. (1990). The generic content of these

two families is still in debate: for example, *Ptilocaulis*, assigned to Desmoxyidae by van Soest et al. (1990) on account of its gross morphological similarity to certain *Higginsia* species, was shown to be very close to *Axinella* of the family Axinellidae by Alvarez et al. (1997); the allocation of *Axinyssa* and *Myrmekioderma* to Halichondriidae is disputed by Hooper & Bergquist (1992) and Hooper & Lévi (1993).

*Myrmekioderma* shares several features with *Julavis*: spined diactinal surface spicules (oxeas in *Myrmekioderma*), smooth



Table 1.—Comparison of spicule types and sizes ( $\mu\text{m}$ ) of *Julavis levis* (Kirkpatrick 1900) and *J. jamaicensis* n.sp. (ranges, means in italics).

Spicule type	<i>Julavis levis</i>	<i>Julavis jamaicensis</i>
Acanthostrongyles	211–280.5–340 $\times$ 7–11.1–14	127–185.2–258 $\times$ 8–14.1–20
Strongylostyles*	<1385 $\times$ 4–12	<850 $\times$ 4–8
Trichodragmas	144–178.3–200 $\times$ 3–3.8–12	52–108.3–152 $\times$ 2–3.7–8

\* Most often broken in the spicule slides.

diactinal choanosomal spicules (oxeas in *Myrmekioderma*), and wispy trichodragmas. The two genera are nevertheless considered to be distinct because spination of the surface spicules in *Myrmekioderma* is very fine (and may be occasionally absent) and the choanosomal spicules are arranged in definite tracts. The surface of the known species of *Myrmekioderma* shows a characteristic groove pattern (see van Soest et al. 1990).

A further genus sharing features with *Julavis* is *Heteroxya* Topsent, 1904. Van Soest et al. (1990) tentatively considered it a junior synonym of *Myrmekioderma*, but the evidence for that assumption is weak. The genus is defined as having spined and smooth oxeas in a confused mass, with smaller spined oxeas forming a dense palisade at the surface. No trichodragmas have been reported from the type and only assigned species, *H. corticata* Topsent, 1904. The strongylote and stylote spicules as well as the possession of trichodragmas easily differentiate *Julavis* from *Heteroxya*.

Another genus that needs to be considered is *Higginsia* (Desmoxyidae), which likewise shares with *Julavis* diactinal spined surface spicules (oxeas) over much longer smooth choanosomal spicules. The two genera are considered distinct because the spined oxeas of *Higginsia* have a distinct angular curve in the middle. These spicules often do not form a surface crust but are scattered among the choanosomal megascleres. The choanosomal skeleton consists of well-defined tracts of smooth megascleres.

*Julavis* links *Higginsia* and *Myrmekioderma* by its possession of coarsely spined

diactinal surface spicules (shared with *Higginsia*) and wispy trichodragmas (shared with *Myrmekioderma*). It is sufficiently distinct from both in possessing acanthostrongyles in a thick surface feltwork. Accordingly we propose to include *Julavis* in a rearranged and redefined family Desmoxyidae, which in disagreement with van Soest et al. (1990) receives *Myrmekioderma* and the closely similar *Didiscus* from the family Halichondriidae, and loses *Ptilocaulis* to the family Axinellidae.

*Family Desmoxyidae*.—Halichondrida with a surface skeleton consisting of spined diactinal spicules (oxeas or strongyles); the choanosomal skeleton is formed either by a confused or perpendicular arrangement of single spicules or interconnected bundles perpendicular to the surface.

*Higginsia* Higgin, 1877 (jun. syn. *Desmoxya* Hallmann 1917): spined oxeas with abrupt angular curve in the middle; choanosomal skeleton an elaborate system of bundles of megascleres.

*Halicnemia* Bowerbank, 1866: spined oxeas with abrupt angular curve in the middle; two categories of choanosomal megascleres one of which is erect on the substrate while the other surrounds the first.

*Heteroxya* Topsent, 1904: Surface skeleton a palisade of smaller spined oxeas, though which perpendicular subectosomal longspined oxeas protrude; choanosomal skeleton a confused mass of smooth and spined oxeas.

*Myrmekioderma* Ehlers, 1870: surface oxeas rugose or finely spined; choanosomal megascleres in several length categories arranged in a system of interconnected tracts; microscleres wispy or straight trichodrag-

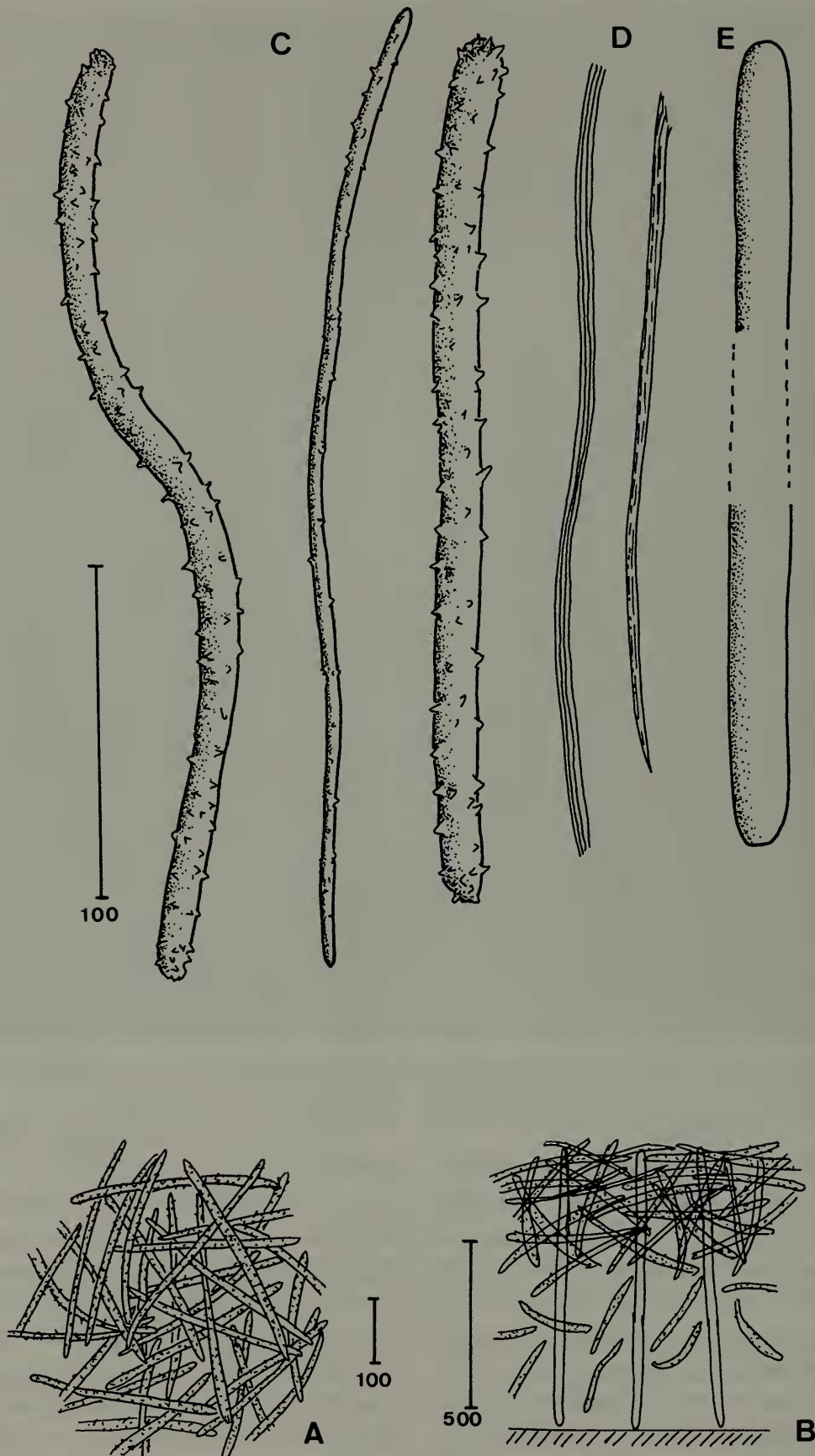


Fig. 4. *Julavis levis* (Kirkpatrick), holotype BMNH 1900.10.19.16, drawing of skeleton and spicules. A, surface view of ectosomal skeleton; B, cross section; C, various growth stages of acanthostrongyles; D, trichodragmas; E, smooth strongyle.

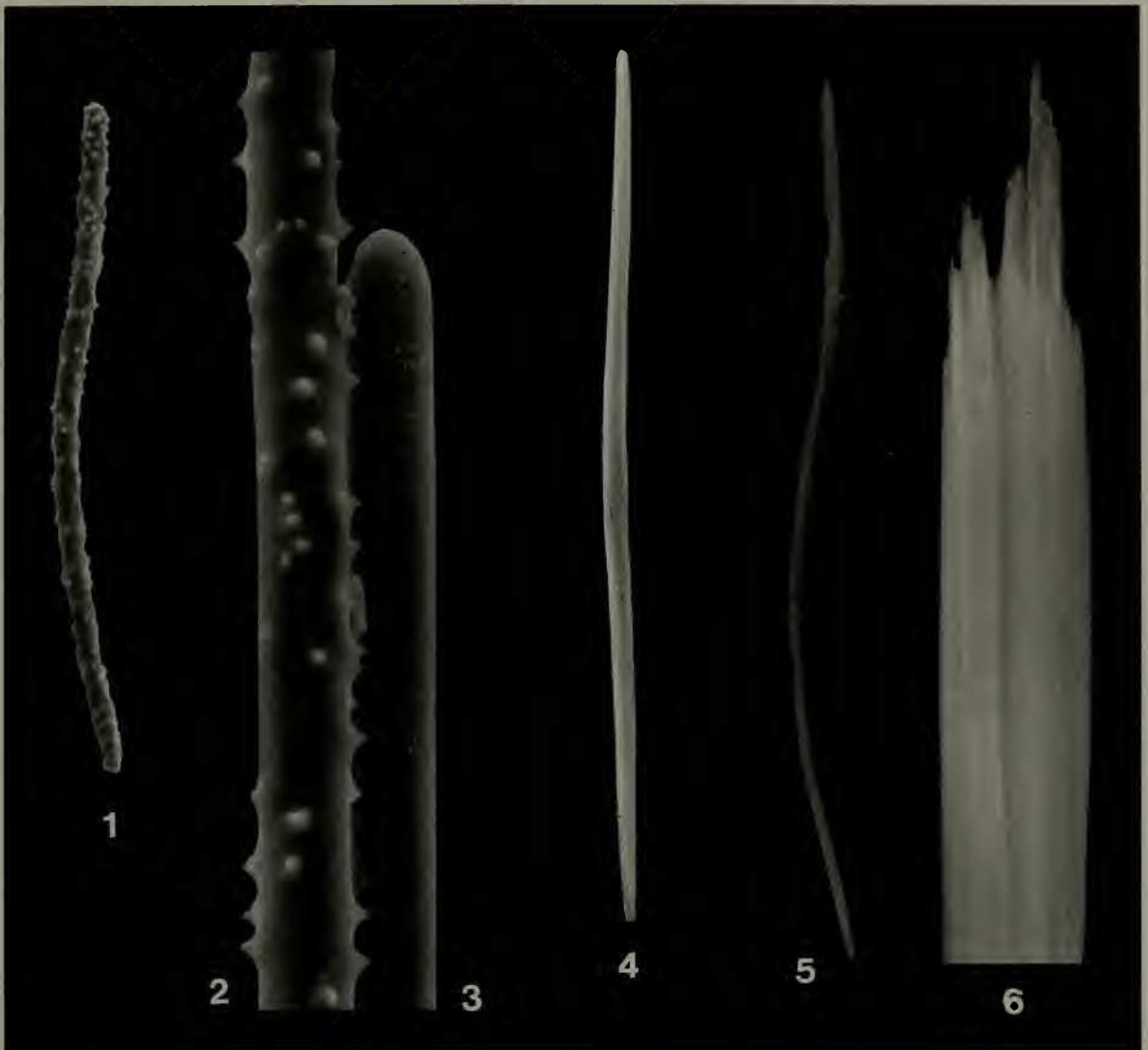


Fig. 5. *Julavis levis* (Kirkpatrick), holotype BMNH 1900.10.19.16, SEM photos of the spicules. 5.1, acanthostrongyle ( $\times 300$ ); 5.2, detail of part of acanthostrongyle ( $\times 800$ ); 5.3, terminal part of smooth strongyle ( $\times 800$ ); 5.4, sheathed trichodragma ( $\times 300$ ); 5.5, partly split-open trichodragma ( $\times 300$ ); 5.6, detail of trichodragma ( $\times 2200$ ).

mas; surface has characteristic sinuous grooves.

*Didiscus* Dendy, 1922: surface oxeas rugose or finely spined, possessing two unequally sized discs asymmetrically along the shaft; choanosomal megascleres in several length categories arranged in a system of interconnected tracts; surface has characteristic sinuous grooves.

*Julavis* de Laubenfels, 1936: surface spicules are coarsely spined strongyles forming a thick felted mass at the surface; choanosomal skeleton reduced, consisting

of long strongylostyles arranged singly perpendicular to the surface; wispy trichodragmas.

#### Acknowledgments

HL was funded by the Deutsche Forschungsgemeinschaft (Re 665/10-1) and thanks Prof. Dr. Joachim Reitner, the project leader. Thanks also to the dive-buddies Greg Lee and Jean Luc Solandt and to the "Reefkeepers", Montego Bay who supplied boat and tanks. This is contribution



Nr. 591 of the Discovery Bay Marine Laboratory, Jamaica.

Ms Clare Valentine graciously sent us the specimen of *Tedania levis* on loan. Louis Van der Laan (ZMA) made the habit photograph; Jan Vermeulen (ZMA) made the SEM photos. John Hooper (Brisbane) gave valuable advice.

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